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ABSTRACT

The primary purpose of this study was to compare the effectiveness of infant test scores, Home Observation for Measurement of the Environment (HOME) scores, socioeconomic factors and maternal IQ as predictors of children's mental test performance. Additional purposes were to (1) determine the extent to which sociceconomic factors and maternal characteristics were associated with HOME scores, and (2) determine how well the HOME would predict child test perfcrmance if the influence of economic resources or maternal ability level were partialed cut of the correlations. The study was based upon a socioeconomically heterogeneous sample of 41 mother-child dyads. The HOME and the Bayley Scales of Infant Development were administered when the children were 6- and 18-months-old. Thirty-six of the 41 children participated in follow-up testing with the Stanford-Binet Intelligence Scale at 48 months of age. Results suggest that in a socioeconcmically heterogeneous sample, knowledge of the family's earned income at the time of the child's birth predicted children's intellectual status at age of 4 as well as did HOME scores gathered in the first or second year of life. Mothers' IQ predicted child IQ best of all. After the effect of maternal intellectual differences upon child intellectual outcomes was partialed out, a measure of early environmental quality showed no relationship to child outcomes. (Author/RH)

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How May We Best Predict a Child's IQ?

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How May We Best Predict a Child's IQ?

Psychologists continue to seek valid methods of predicting a child's intellectual potential from classes of information available in infancy. Such measures as scores on standardized tests of infant development, or demographic variables like parental income and educational level have been used to predict children's intelligence. Standardized tests of infant cognitive development appeared to predict IQ in later childhood less well than did parental socioeconomic status (McCall, Hogarty, & Hurlburt, 1972). Specific facilitating characteristics of the home were shown to be more related to specific abilities in children than was a global measure of parental socioeconomic status (Walberg & Majoribanks, 1973). Elardo, Bradley, and Caldwell (1975) reported a longitudinal study in which they successfully used an instrument designed to measure important characteristics of the infant's home, the Home Observation for Measurement of the Environment, (HOME), to predict later mental test performance. HOME scores obtained in infancy correlated .54 with Stanford-Binet IQ at age 3. Bradley and Caldwell (1976) have also reported that gains and losses over time in children's tested intelligence were related to scores on certain of the HOME subscales.

The HOME, which is scored from a combination of direct observation and interview information, contains 6 subscales: Emotional and Verbal Responsivity of the Mother, Absence of Restriction and Punishment, Organization of the Physical and Temporal Environment, Provision of Appropriate Play Material, Maternal Involvement with the Child, and Opportunity for Variety in Daily Stimulation. A total score is obtained as well.

The studies cited above involving the HOME were based on samples with a fairly wide range of socioeconomic backgrounds, hence it is unclear to what extent socioeconomic differences might underlie the obtained results.

It has been reported that disadvantaged mothers scored significantly below middle class mothers on all subscales of the HOME (Ramey, Mills, Campbell, & O'Brien, 1975), and that scores on the HOME were associated with maternal education, socioeconomic status and maternal authoritarianism (Jordan, 1978).

The purposes of the present research were first, to compare the effectiveness of infant test scores, HOME scores, socioeconomic factors and maternal IQ as predictors of children's mental test performance; second, to determine the extent to which socioeconomic factors and maternal characteristics were associated with scores on the HOME; and third, to determine how well the HOME would predict child test performance if the influence of economic resources or maternal ability level were partialled out of the correlations.

METHOD

Subjects

The study was based upon a socioeconomically heterogeneous sample of 41 mother-child dyads of which 29 were black and 12 white. There were 14 male children and 27 female children. Earned annual income for families at the time of the child's birth ranged from none (Aid for Families with Dependent Children payments were not counted) to more than $22,000; the median value was $2500. Family was defined as father-mother-child in traditional two parent households or as the mother-child dyad in single parent families. Mean maternal age was 23.4 years, the range was from 14 to 44 years; mean maternal education was 11.93 years, with a range of 6 to 17 years. Mean maternal IQ was 92.3 points (Wechsler Full Scale score). The range of maternal IQ scores was from 59 to 136 points.

The children's mean Bayley Mental Development Index scores were 103.58 and 95.02 at 6 and 18 months respectively. Their mean Stanford-Binet IQ at 48 months was 94.92 points with a range of 64 to 130 points.

Procedure

Each family was visited when the children were 6 months and 18 months old. The HOME was scored on both occasions. Children were tested at a university laboratory site. All children were given the Bayley Scales of Infant Development at 6 and 18 months of age. Thirty-six of the 41 children were available for follow-up testing with the Stanford-Binet Intelligence Scale at 48 months of age.

Pearson product moment correlations of 48 month IQ with Bayley Mental Development Index at 6 and 18 months, scores on the HOME at 6 and 18 months, maternal age, maternal education, earned income at the time of the child's birth, and maternal IQ score were computed. The latter four demographic and maternal variables were then correlated with scores on the HOME. Finally, partial correlations showing the degree of relationship between the children's 48 month IQ score and scores on the HOME, controlling separately for the effects of income or maternal IQ, were computed.

RESULTS

Table 1 gives the correlations obtained between child IQ at age 4 and

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Insert Table 1 about here

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infant test scores, HOME scores, demographic variables measured in the child's first year, and maternal IQ. Mother's age at the time of the child's birth did not predict the 48 month IQ score nor did the Bayley MDI at 6 months. Scores on the HOME obtained at 6 months, however, predicted well, correlating .59 with 4 year IQ, very close to the figure reported by Elardo, Bradley and Caldwell (1975). The Bayley MDI at 18 months and knowledge of maternal educational level at the time of the child's birth equalled one another in

effectiveness, both correlating .64. Better still were scores on the HOME obtained at 18 months of age and knowledge of earned income, correlating .69 and .70 respectively. Far outranking other predictors in this study, however, was the maternal IQ score, which correlated .82 with child test scores.

Pearson correlations of earned income, maternal age, maternal education, and maternal IQ and subscales with total scores on the HOME at 18 months are shown in Table 2. The correlations show that earned income, maternal education and maternal IQ were all significantly related to scores

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Insert Table 2 about here

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on the HOME, but that maternal age was less so. Maternal age showed a weak positive relationship to the total score at 18 months. At the subscale level, income and maternal education were most strongly related to Provision of Appropriate Play Materials, both correlating .69, whereas maternal IQ correlated most highly with Maternal Involvement (r = .75).

Since maternal IQ and two of the three demographic variables, earned income and maternal education, were highly related to scores on the HOME, these factors might well have been partly responsible for the relationship between scores on the HOME and child IQ scores. Accordingly, partial correlations were computed to determine how well the HOME would predict children's mental test performance if the effects of either maternal IQ or of earned income were controlled. Table 3 shows the simple and partial correlations controlling for the effects of income and maternal IQ between scores on the HOME at 6 months and children's test scores at 6, 18, and 48 months of age.

Insert Table 3 about here

Scores on the HOME at 6 months were unrelated to scores on the Bayley obtained at the same age, and controlling for income or maternal IQ had virtually no effect on the pattern of correlations. In contrast, Pearson correlations showed every HOME subscale and the total score at 6 months to be significantly related to the 18 month Bayley MDI. Controlling for the effects of income had a more pronounced effect upon the predictability of the 18 month Bayley MDI from the 6 month HOME scores than did controlling for the effects of maternal IQ. Partialling out the effects of income left 13% of the variance in the 18 month Bayley MDI predictable from scores on the HOME at 6 months, whereas controlling for maternal IQ left 20% of the variance in the Bayley score predictable from the HOME total score.

The most dramatic result of partialling out the influence of income or maternal IQ was upon the predictability of the 48 month IQ score from HOME scores obtained at 6 months. Whereas Pearson correlations indicated that total HOME scores obtained in the first year predicted 48 month IQ quite well (r=.59), when the effects of either income or maternal IQ were partialled out, the correlations between scores on the HOME and 48 month IQ were reduced to nonsignificance, many to near zero. For example, HOME total score at 6 months, with income controlled, correlated .01 with 48 month IQ; with maternal IQ controlled, the correlation was -.03. At the subscale level, whereas Pearson correlations between every 6 month subscale except Emotional and Verbal Responsivity of the Mother were significantly related to 48 month IQ, controlling for the effects of either income or maternal IQ reduced all correlations to nonsignificant levels.

DISCUSSION

The present results suggest that, in a socioeconomically heterogeneous sample such as the one studied here, an inexpensive and readily obtainable socioeconomic index, knowledge of the family's earned income at the time

of the child's birth, predicted children's intellectual status at age 4 as well as did scores on the HOME gathered in the first or second year of life. Earned income accounted for 49% of the variance in child IQ at age 4, HOME score at 18 months predicted 48%. These results, indicating similar predictability from the HOME and from socioeconomic status, disagree somewhat with the findings reported by Bradley, Caldwell, and Elardo (1977) in which the HOME proved to be a better predictor of child intellectual performance than did socioeconomic variables. One reason for the discrepancy might be that the present sample represented a wider range of socioeconomic backgrounds than did the group studied by Bradley, Caldwell and Elardo. Hence the degree of variability in HOME scores and socioeconomic factors may have been greater in this study. Occupations of heads of households in the present sample varied from unemployment to professional level.

One of the important outcomes in the present study is the finding that knowledge of the mother's IQ predicted child IQ best of all, accounting for 67% of the variance in children's 4 year IQ. This leads to the question of the degree to which differences in maternal IQ might be accounting for differences on the HOME. After the effect of maternal intellectual differences upon child intellectual outcomes, as predicted from the HOME, was partialled out, a measure of early environmental quality showed no relationship to child outcomes. Thus it appeared that intellectual factors and early environmental quality factors may have been confounded. More able parents appeared to provide more facilitating environments, just as they tended to be parents with greater economic resources.

The present research affirms once again that the HOME reflects meaningful factors related to children's intellectual growth, but it appears that economic and intellectual differences between parents are confounding factors and that if the effects of these are controlled, a

measure of early environmental quality does not predict children's later intellectual level.

References

Bradley, R. H., & Caldwell, B. M. Early home environment and changes in mental test performance in children from 6 to 36 months. Developmental Psychology, 1976, 12, 93-97.

Bradley, R. H., Caldwell, B. M., & Elardo, R. Home environment, social status, and mental test performance. Journal of Educational Psychology, 1977, 69, 697-701.

Elardo, R., Bradley, R., & Caldwell, B. M. The relation of infants' home environments to mental test performance from six to thirty-six months: A longitudinal analysis. Child Development, 1975, 46, 71-76.

Jordan, T. E. Influences on vocabulary attainment: A five-year prospective study. Child Development, 1978, 49, 1096-1106.

McCall, R. B., Hogarty, P. S., & Hurlburt, N. Transitions in infant sensorimotor development and the prediction of childhood IQ. American Psychologist, 1972, 27, 728-748.

Ramey, C. T., Mills, P., Campbell, F. A., & O'Brien, C. Infants' home environments: A comparison of high-risk families and families from the general population. American Journal of Mental Deficiency, 1975, 80, 40-42.

Walberg, H., & Marjoribanks, K. Differential mental abilities and home environment: A canonical analysis. Developmental Psychology, 1973, 9, 363-368.

Footnote

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Table 1

Prediction of 48 Month Stanford-Binet Score from Infant Test Scores, HOME Scores, Demographic Variables, and Maternal IQ

Class of Variable	r	p
I Bayley Score		
MDI 6	.14	N.S.
MDI 18	.64	<.0001
II HOME Total Score		
HOME 6	.59	<.0002
HOME 18	.69	<.0001
III Demographic Variables		
Maternal Age	.17	N.S.
Maternal Education	.64	<.0001
Earned Income	.70	<.0001
IV Maternal IQ	.82	<.0001

Table 2

Pearson Correlations Between Demographic and Maternal Variables and HOME Scores at 18 Months

HOME Scale		Earned Income 18 (N=40)	Maternal Age 18 (N=41)	Maternal Education 18 (N=41)	Maternal IQ 18 (N=40)
I	Maternal Warmth	.39*	.16	.34*	.43**
II	Absence of Punishment	.47**	.15	.31*	.52***
III	Organization of Environment	.53***	.43**	.48**	.52***
IV	Provision of Appropriate Play Materials	.69***	.30	.69***	.71***
V	Maternal Involvement	.65***	.15	.64***	.75***
VI	Opportunities for Variety	.64***	.31*	.64***	.61***
	Total	.75***	.32*	.70***	.79***

* p = <.05

** p = <.01

*** p = <.001

Table 3

Simple and Partial Correlations of Scores on the HOME at 6 Months with Bayley MDI Scores at 6 and 18 Months, and Stanford-Binet IQ at 48 Months

HOME Subscale	Test Score: MDI 6 Months r	$r_{\cdot Income}$	$r_{\cdot MIQ}$	MDI 18 Months r	$r_{\cdot Income}$	$r_{\cdot MIQ}$	IQ 48 Months r	$r_{\cdot Income}$	$r_{\cdot MIQ}$
1. Emotional and verbal responsivity of mother	.17	.11	.15	.36*	.13	.32*	.27	-.22	-.19
2. Avoidance of restriction and punishment	-.10	-.18	-.13	.32*	.17	.23	.36*	-.02	-.04
3. Organization of the physical and temporal environment	.31*	.27	.30*	.45**	.30*	.39**	.49**	.14	.18
4. Provision of appropriate play materials	.18	.08	.13	.46**	.21	.30*	.53***	.19	.09
5. Maternal involvement with child	.26	.21	.24	.52***	.34*	.41**	.53***	-.02	-.06
6. Opportunity for variety in daily stimulation	.26	.17	.21	.37*	.15	.26	.51**	.09	-.01
Total score	.24	.16	.21	.56***	.36*	.45**	.59***	.01	-.03

*p=<.05

**p=<.01

***p=<.001